Digitized by the Internet Archive
in 2009 with funding from
University of Toronto

http://www.archive.org/details/n02radium03came

RM
859
R313
v.3
no.2
c.1
GERSTS

RADIUM

EDITED BY
CHARLES H. VIOL, Ph. D.
AND
WILLIAM H. CAMERON, M. D.

VOL. III MAY, 1914 No. 2

CONTENTS

The Influence of Intravenous Injection of Soluble Radium Salts in High Blood Pressure II, by Frederick Proescher, M.D. 17

Notes and Comments - - - - - - - - - 21

Notes on a Case of Epithelioma Treated by Radium, by F. L. de Verteuil, M. D. (Edin.) F. R. C. S. - - - - - - - - - - - - - 23

Reviews and Abstracts - - - - - - - - 24

LIBRARY
NOV 1 3 2001
UNIVERSITY OF TORONTO
THE PROPERTY OF
QUEEN'S PARK

A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY PHYSICS AND THERAPEUTICS OF RADIUM AND RADIO-ACTIVE SUBSTANCES

RADIUM

A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY, PHYSICS AND THERAPEUTICS OF RADIUM AND RADIO-ACTIVE SUBSTANCES.

Edited and Published by Charles H. Viol, Ph. D. and William H. Cameron, M. D., with the assistance of collaborators working in the fields of Radiochemistry, Radioactivity and Radiumtherapy.

Subscription $2.50 per year, or 25 cents per copy in the United States and Canada; in all other countries $3.75 per year.

Address all communications to the Editors, Forbes and Meyran Avenues, Pittsburgh, Pa.

VOL. III MAY, 1914 No. 2

INFLUENCE OF INTRAVENOUS INJECTION OF SOLUBLE RADIUM SALTS IN HIGH BLOOD PRESSURE II.

By Frederick Proescher, M. D.

For the proper analysis of the effect of radium upon the circulatory system I wish to refer to the significance of the systolic, diastolic and pulse pressure and its relation to the cardiac load and overload as lately pointed out by V. T. *Stone*. The difference between the systolic pressure or maximum pressure exerted by the kinetic energy of the blood mass and the diastolic or minimum pressure, or potential energy exerted by the wall of the vessels, is the pulse pressure. It represents the amount of intermittent pressure on the wall of the arteries due to the muscular energy of the heart during systole forcing the blood towards the peripheric to maintain the circulation. We therefore can define the pulse pressure as the amount of pressure produced by the heart during systole in excess of the diastolic pressure. It represents the excess of dynamic over potential energy or in other words the load of the heart. The pulse pressure causes the distention of the arteries and is recognized as the pulse. If we consider the average systolic pressure as 120, the diastolic as 80, the pulse pressure average would be 40. The normal heart load therefore may be 40/80 or 50% of the diastolic pressure. The systolic pressure and pulse pressure represents the myocardial strength, the diastolic pressure the arterial resistance.

Table showing immediate and final reduction of the blood pressure and the influence upon the heart load after intravenous injection of radium element:

CASE No. 1—100 Micrograms Radium Element.

	Pressure	Immediate Reduction	Final Reduction	Total Reduction
Systolic	170mm.	135mm.	135mm.	35mm.
Diastolic	100	80	90	10
Pulse	70	55	45	25
Heart load	70%	60%	50%	
Heart overload	20%	19%	00%	

CASE No. 2—200 Micrograms Radium Element

	Pressure	Immediate Reduction	Final Reduction	Total Reduction
Systolic	220mm.	195mm.	175mm.	45mm.
Diastolic	140	120	140	00
Pulse	80	60	35	45
Heart Load	57%	50%	25%	
Heart overload	7%	00%	00%	

CASE No. 3—150 Micrograms Radium Element.

	Pressure	Immediate Reduction	Final Reduction	Total Reduction
Systolic	195mm.	120mm.	135mm.	60mm.
Diastolic	100	80	100	00
Pulse	95	40	35	60
Heart load	95%	50%	35%	
Heart overload	45%	00%	00%	

CASE No. 4—250 Micrograms Radium Element

	Pressure	Immediate Reduction	Final Reduction	Total Reduction
Systolic	160mm.	150mm.	155mm.	5mm.
Diastolic	95	85	105 Increase	10
Pulse	65	65	50	15
Heart load	68%	76%	48%	
Heart overload	18%	26%	00%	

CASE No. 5—300 Micrograms Radium Element.

	Pressure	Immediate Reduction	Final Reduction	Total Reduction
Systolic	205mm.	145mm.	180mm.	25mm.
Diastolic	120	110	110	10
Pulse	85	35	70	15
Heart load	70%	32%	64%	
Heart overload	20%	00%	14%	

CASE No. 6—150 Micrograms Radium Element.

	Pressure	Immediate Reduction	Final Reduction	Total Reduction
Systolic	170mm.	170mm.	140mm.	30mm.
Diastolic	95	115	90	5
Pulse	75	55	50	25
Heart load	78%	48%	55%	
Heart overload	28%	00%	5%	

CASE No. 7—500 Micrograms Radium Element

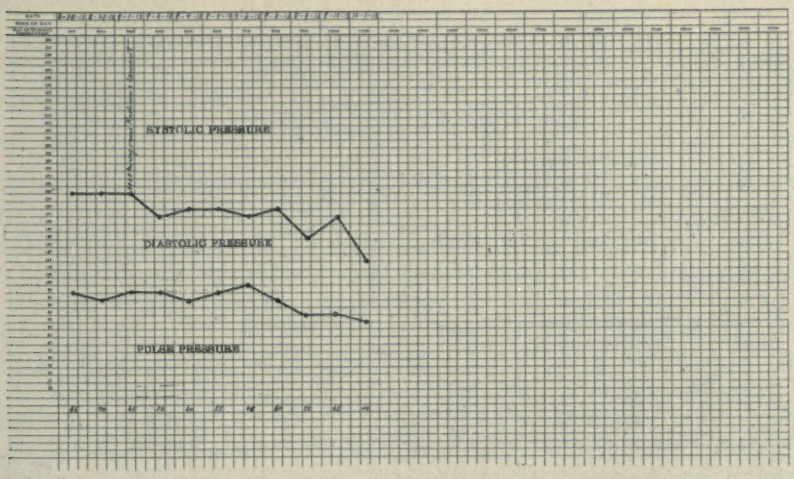
	Pressure	Immediate Reduction	Final Reduction	Total Reduction
Systolic	210mm.	195mm.	200mm.	10mm.
Diastolic	115	105	105	10
Pulse	95	95	95	00
Heart load	83%	86%	90%	
Heart overload	33%	35%	40%	

In conclusion we may say that the radium acts mainly on the systolic pressure or has a direct effect upon the heart muscle as the systolic pressure represents the myocardial strength. The

effect upon the heart muscle is noted directly after the injection of the radium and is maintained for a longer period. The diastolic pressure is reduced less and after the two months observation showed little reduction. As the diastolic pressure represents the arterial resistance it would indicate that the radium has little effect upon the vasoconstrictors of the muscular wall of the vessels. The dilatation of the arteries seems therefore not to play an important role in lowering the blood pressure. The pulse pressure and the heart load are correspondingly lowered and in some of the cases reached their normal mark. The amount of reduction of the blood pressure seems not to be proportional to the amount of radium injected as in some cases small quantities are sufficient to lower the blood pressure considerably while in other cases large doses have only a moderate or little effect.

Observations over longer periods will determine as to the permanency of the blood pressure lowering effects of the radium. The marked decrease of the blood pressure after the intravenous radium injection gives rise to the question whether there is any danger in the injection of radium in individuals with normal or relatively low pressure. I may say that in none of our cases was any ill effect upon the heart or circulatory system observed in spite of lowering the pulse pressure. In none of the cases was a lower systolic pressure than 85 mm. observed.

That also a large dose of 1000 micrograms of radium element given at one time had no injurious effect upon the circulatory system could be demonstrated in an inoperable case of carcinoma of the uterus and a case of myelogenous leukaemia. The carcinoma case received 1000 micrograms at one dose. The following chart shows that the blood pressure gradually declined from 160 mm. to 115 mm.

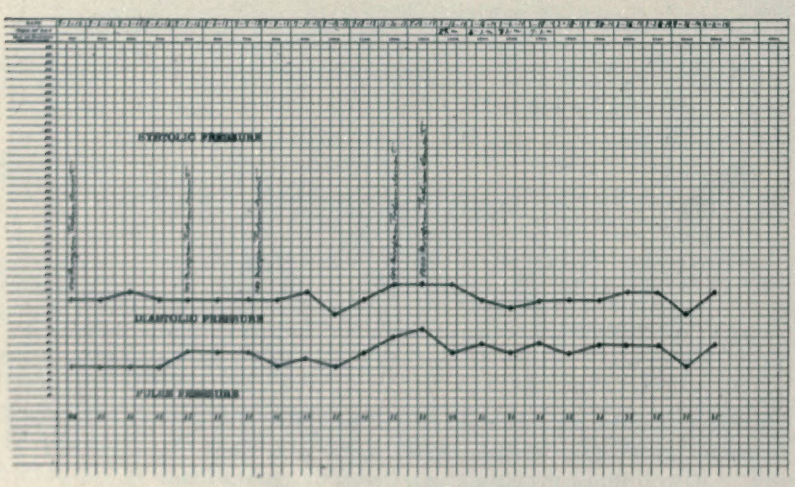


Blood Pressure Chart, Cervix Carcinoma Case.

CASE OF CERVIX CARCINOMA

Date	Systolic	Diastolic	Pulse Pressure
8-28-13	160mm.	95mm.	65mm.
8-29-13	160	90	70
9- 1-13	160	95	65
	1000 micrograms radium element intravenously.		
9- 3-13	145	95	50
9- 4-13	150	90	60
9- 5-13	150	95	55
9- 6-13	145	100	45
9- 8-13	150	90	60
9- 9-13	130	80	50
9-15-13	145	80	65
10- 1-13	115	75	40

The leukaemia case received inside of eight months 1400 micrograms, the first 300 micrograms being given in fractional doses of 100 micrograms in seven days. About five months later another 100 micrograms was given. The blood pressure after the injection of the 400 micrograms showed very little change the lowest pressure being noticed on 7-12-13, being 85 mm. and showed tendency to raise. On 12-30-13 it showed 105 mm. On 3-16-14 1000 micrograms was given, the systolic and diastolic pressure declined inside of seven hours 15 mm. only and reached its lowest mark 4-4-14, 28 days after the injection, with 85 mm. systolic and 50 mm. diastolic pressure, a total decrease of 20 mm. and 25 mm. respectively. This case demonstrated further the noncumulative action of the radium and that 1000 micrograms of radium element can be safely given. This is of special interest for the treatment of leukaemia. It takes a large dose of radium element given at once to reduce the leucocytes in leukaemia, small fractional doses being without effect. In this case no reduction of the white cells was observed after giving 400 micrograms in fractional doses. After the injection of 1000 micrograms the leucocytes were reduced from 360,000 to 105,000. This case will be reported later in detail.



Blood Pressure Chart, Leukaemia Case.

LEUKAEMIA CASE.

Date	Systolic	Diastolic	Pulse Pressure
7- 1-13	95mm.	50mm.	45mm.
	100 micrograms radium element intravenously.		
7- 2-13	95	50	45
7- 313	100	50	50
7- 4-13	95	50	45
7- 5-13	95	60	35
	100 micrograms radium element intravenously.		
7- -13	95	60	35
7- 7-13	95	60	35
	100 micrograms radium element intravenously.		
7- 8-13	95	50	45
7-10-13	100	55	45
7-12-13	85	50	35
7-18-13	95	55	40
12-20-13	105	70	35
	100 micrograms radium element intravenously.		
3-16-14	105	75	30
3-16-14 1:30 P. M.	1000 micrograms radium element intravenously.		
2:15 P. M.	104	60	44
3:00 P. M.	96	65	31
7:00 P. M.	90	60	30
3-17-14	95	65	30
3-18-14	95	60	35
3-20-14	95	65	30
3-23-14	100	65	35
3-28-14	100	65	35
4- 4-14	85	50	35
4-11-14	100	65	35

In summary we can say that of the seven cases with hypertension five responded readily to the radium injection, in two cases no marked reduction was observed. Further investigation must be made to determine whether large doses of radium given at once would lower the blood pressure in such refractory cases. Radium applied intravenously over a long period exerts a slow progressive blood pressure lowering effect without causing any injurious effects to the organism, and for this reason is preferable to thorium X.

* * * * *

NOTES AND COMMENTS

At the annual meeting of the National Academy of Sciences, which took place in Washington, D. C., April 21 to 23rd, Sir Ernest *Rutherford,* of the University of Manchester, gave two illustrated lectures on the constitution of matter and the evolution of the elements. These lectures were founded in memory of the late Wm. Ellery *Hale,* of Chicago, and were inaugurated by Sir Ernest *Rutherford.* Sir Ernest explained how the discovery of radioactivity and the study of the electron have revolutioned our views on the nature of matter. By this new means of investigation the chemical elements and the complex compounds which they unite to form may be shown to consist of positive and negative electricity. Moreover, all negative electrons are precisely alike,

from whatever form of matter they may be derived. Thus we are prepared to witness some of the transformations of the chemical elements, such as the spontaneous disintegration of radium and the production of helium from it.

* * * * *

At the meeting of the American Physical Society, held at the Bureau of Standards, Washington, D. C., April 24th and 25th, an exhibit of apparatus was arranged. Among the things of interest along the lines of radioactivity were emanation applicators and the radium emanation lamp prepared by Prof. Wm. *Duane,* of Harvard University, a lecture demonstration for showing the emission of alpha rays by Prof. *Pegram,* of Columbia University, and a display of radium salts by the Radium Research Laboratory of the Standard Chemical Company of Pittsburgh. The apparatus exhibit was installed in the newly completed electrical building of the Bureau of Standards in which is located the laboratory for research work in the measurement of radium, Dr. N. Ernest *Dorsey* being actively engaged in work along these lines.

* * * * *

In honor of Pierre *Curie,* the discoverer of radium, the Council of Paris has decided to establish a square on the left bank of the Seine at the end of the bridge Pontneuf, where *Curie* unfortunately met his death in April, 1906. The square will be named Pierre *Curie* Square.

* * * * *

We quote the following from the London Letter in the March 21st, 1914, Journal of the American Medical Association in regard to "Radium and Cancer": "At the annual meeting of the governors of the Cancer Hospital, Mr. Charles *Ryall,* F. R. C. S., chairman of the medical committee, described the present position of radium treatment to cancer. He said that although a great deal had been written in the lay press of late concerning radium and the marvelous cures which it had apparently affected, radium had not come to supplant surgery in the treatment of cancer, but to aid it. Cancer was a disease which grew from day to day and eventually reached the incurable stage, and therefore for safety it must be got rid of as early as possible, and the quickest and surest means was still the knife. There were cases, however, in which operation was either inadvisable or impossible, and in these, radium and the Roentgen rays were resorted to. Radium was the most active substance known, and it was proved that it had a definite action on living cells. In cancer it had been found to exert a definite action either by destroying the cancer cells or by retarding or preventing their growth. The properties of radium were comparatively little known, and therefore radium treatment was in the experimental stage, in which attempts were being made to fathom its effects on disease, especially cancer, to estimate its dosage, and to classify what cases were suitable for treatment by it. That would mean some years of work, and it would, there-

fore, be well if silence could be maintained for the next two years until some definite announcement could be made.

A definite pronouncement with regard to research might be awaited with confidence, as the radium research work in this country was being carried on systematically. There was an enormous field for research and treatment among the patients at that hospital, but the workers were hampered by the inadequate quantity of radium at their disposal and their inability to procure more owing to its scarcity and enormous cost.

* * * * *

In a Vienna hospital recently a patient suffering with cancer of the tongue, swallowed the tube containing about fifty milligrams of radium, which was being applied. The patient had eaten something while the tube was in the mouth. Although denying swallowing the tube, the X-rays showed this to be the case, as the tube had passed into the small intestines there was danger of burning the mucous membranes of the abdominal organs. An operation was performed and the tube was removed. The patient subsequently recovered from the operation.

* * * * *

NOTES ON A CASE OF EPITHELIOMA TREATED BY RADIUM

By F. L. de Verteuil, M. D. (Edin.) F. R. C. S.

The following notes of a case of epithelioma treated by the author may be of interest, as they demonstrate some practical points in connection with radium treatment of that condition:

1. The very excellent cosmetic results obtained.
2. The fact that a radiation of the radium rays sufficient to cause the cells of such a malignant growth to retrogress and disappear, has had apparently no injurious effect on the cells of the hair-roots.
3. Non-success in radium treatment may be due not to the radium, but to the faulty technic of the operator.

The patient, an old man, age 72, had a well defined epitheliomatous growth on the right cheek, somewhat below the malar eminence and towards the beard region. This growth had begun some years previously as a small warty excrescence which in spite of various forms of local treatment had gradually got worse. When I first saw the patient, there was a deep central ulcerated area nearly the size of a half dollar. The edges of this ulcer were hard and everted showing in a few places some small pearly nodules. Beyond the ulceration there was considerable infiltration which gradually shelved off into the surrounding tissues, and the growth seemed fixed to the underlying bone. Two years previously the patient had a very similar condition on the dorsum of

his left hand for which his attending physician had found it necessary to have the hand amputated beyond the wrist-joint. On the dorsum of the right hand there were several senile warts, one of which appeared to be in a transitional stage between malignancy and non-malignancy. The condition on the cheek was treated with two varnish applicators containing 10.4 milligrams and 2 milligrams of radium element, covering a square area of 8 centimeters and 1.5 centimeters respectively.

Several applications varying from 1 hour to 2 hours were made, the applicators being screened in a lead filter about ½ millimeter thick. Three applications were made at odd intervals varying from two days to a month, as the patient was very irregular in his attendance.

Four months later there was practically no change in his condition. The technic was then modified, a lead filter 2 mm. thick was used and the patient given 5 application of four hours each with the larger applicator. The applications were made within a period of two weeks and within ten days after the last application there was a noticeable change, and six weeks later the condition was completely healed, having a fine cicatrix over the central ulcerated area. This has since contracted and is scarcely visible. There was never at any time the least irritation of the treated area. The most remarkable thing, however, is the fact that the patient has since grown a beard, and that the hair has grown over the irradiated area and shows no difference in appearance from the other side. It is extremely difficult to show on which side the growth originally was, the only distinction being a small depressed area showing on close examination a very small smooth cicatrix in the center. It is now over eighteen months since the last application of radium was made.

Royer's Block,
Vancouver, B. C.

REVIEWS AND ABSTRACTS.

Frank E. *Simpson*. Radium in the Treatment of Blastomycosis. Jour. Am. Med. Assn., Vol. 62, pp. 844-5, (1914). The case reported is that of a man, aged 24, having a lesion of three months' duration at the inner canthus of the left eye, involving the upper and lower lid, and covering an area of about 2 sq. cm. Case presented itself in May, 1913, and the clinical diagnosis of blastamycosis was made and blastomyces were demonstrated in a smear from the peripheral abscesses. A radium varnish applicator, one-quarter strength (1.34 mgm. radium element per sq. cm.) was applied for a total of three hours in the course of three weeks. A slight inflammatory reaction ensued, which caused no pain, and was followed by the complete disappearance of the lesion. Two minute points at the extremities of the lesion on the upper and lower eye lids were noted. After fifteen minutes' exposure on each place these disappeared and recovery has been maintained up to the

present time. The cosmetic result cannot be exceeded by any other method according to *Simpson*. Not the slightest tendency to eversion of the eyelid, and the site of the lesion is almost imperceptible.

* * * * *

Sinclair *Tousey*. A Case of Disseminated Carcinoma of the Breasts and Axillae Improved by Radium. Jour. Am. Med. Assn., Vol. 62, p. 1167, (1914). Case shown at the Surgical Section, N. Y. Academy of Medicine, March 6th, 1914. The right mammary gland and nipple of the patient, a man, had ulcerated away and there was another ulcer below that region. Both were adherent and covered with red parchment-like epidermis and were surrounded with a projecting indurated margin. Nodular masses smaller than a hen's egg were present in both axillae and were widely scattered over the front of the chest. The disease was of several years' standing, but not even an operation for removal of a microscopic specimen had been permitted. The clinical diagnosis had been carcinoma. Treatment was by the application of 20 mgm. radium (element) in the form of pure sulfate, enclosed in a 0.3 mm. thick glass tube surrounded by 0.5 mm. of aluminum and enclosed in thin soft rubber. The treatments were made three times a week for a month and after that once a week.

At each treatment several nodules or the nodular border received an application equal to a total of 15 minutes in each place. At the end of the first month all of the growth on the right side had been treated in this way as well as the floor of the ulcers, the left side being still untreated. By this time the nodular masses on the right side were flat, the cicatrized ulcers were no longer adherent but could be raised and bent double. The right arm could be raised and the patient gained weight and felt stronger. The left side, though untreated, showed marked improvement, leading *Tousey* to believe that X rays and radium rays applied to cancer develops some antibody which is carried through the system and in proper dosage produces benefit to cancer foci beyond the reach of the rays themselves. Treatment of the left side is under way and the course is one of steady progress.

* * * * *

L. *Halberstaedter*. The Biological Effects of the Rays of Radioactive Substances Upon Trypanosomes. Berliner klinische Wochenschrift, Vol. 51, pp. 252-3 (1914). From the Radium Institute for Biological-Therapeutic Research of the Royal Charite (Director, Prof. *His*). Trypanosomes are affected by the rays of radioactive substances (radium, mesothorium and thorium X). This action shows itself when the trypanosomes are rayed in vitro, in a diminished capability to infect. The motility does not furnish a criterion to judge the action of the rays. While a mouse inoculated with the control preparation died on the seventh day, a mouse inoculated with a solution subjected to 30 minutes raying with 10 mgm. of mesothorium, covered with mica and a thin tinfoil, did not die until the eighth day. A preparation rayed one hour

caused death of the inoculated mouse on the eighteenth day, and the preparations rayed for one and one-half and two hours caused no infection. This action is thought to be due to beta rays, since when the mesothorium was screened, even after an exposure of the preparation for 180 minutes, the inoculated mouse died on the seventh day, the same as the control. Using 50 mgm. radium bromide, however, even with screening of 0.1 cm. of aluminum, there was a decided effect on the trypanosomes.

* * * * *

A. v. *Wassermann*. Analysis of the Action of Radioactive Substances Upon Mouse Carcinoma. Deutsche med. Wochenschrift, Vol. 40, pp. 524-8 (1914). (From the Kaiser Wilhelm Institute for Experimental Therapy, Berlin-Dahlem.) The radioactive substances and their rays have recently played a very important part in the therapy of malignant growths. The work of some of the most eminent clinicians has definitely established that the rays of radium or mesothorium properly filtered, undoubtedly have an effect on malignant growths. The reasons for this action on the cells have not been made clear by the clinical observations, and to settle this matter by laboratory experiments is the object of the author's work. The important question to be answered is: Do the rays act directly on the tumor or do the blood or other cells play a part so that the action is indirect? Then too there is the question of a specific selective action upon the tumor in contrast to the normal organs and whether this action consists in the destruction of the neoplasm. To answer the first question satisfactorily *Wassermann* worked with excised mouse carcinoma cells. Three week old growths, the size of a small cherry, of a very virulent strain were carefully removed (aseptic) cut into small pieces with scissors and at once suspended in *Ringer's* solution kept at 37° C. Narrow (0.5 cm.) test tubes were used in each of which about nine of the smallest pieces of tissue were placed with 1 c. c. of *Ringer's* solution. The test tubes were then placed in the incubator maintained at 37° C. and from time to time a bit of the tissue was removed and inoculated into a mouse to test whether the carcinoma cells were capable of further growth. These experiments demonstrated that the cells were capable of living 4.5 hours after removal from the mouse and producing positive inoculation. 55 mgm. of mesothorium (equivalent in activity to 55 mgm. of pure radium bromide or 29.5 mgm. of radium element) enclosed in a thin silver tube and this in turn placed in a nickle-plated brass tube having a wall thickness of 1 mm., was used in the experiment.

In one series of test tubes the controls were run, in the second series there was used an empty nickeled brass tube and in the third series the radioactive substance was used, the tube being placed in the solution in which the fine pieces of mouse carcinoma were suspended. These experiments showed the metal tube alone to be without action on the material, the first and second series giving positive inoculations. When the mesothorium was used, after one

to three hours exposure the cancer tissue gave no inoculation or the development was very slow. The action of the rays upon different sized bits of the mouse cancer showed that when pieces about 0.3 to 1.0 mm. in diameter were used the rays were very effective but when pieces about 3 mm. in diameter were used the effect of the rays was less marked. In order to test whether the rays actually destroyed the power of reproduction, bits of exposed growths were placed in normal salt solution containing a few drops of methylene blue solution. Over this solution was placed a layer of liquid paraffin. Bits of tissue which had been boiled in water five minutes were treated similarly and gave no reduction of the methylene blue, whereas the pieces of tissue which had been exposed to the action of the mesothorium for 3 to 3.5 hours caused a decolorizing of the methylene blue, showing that the cells were not killed by the action of the rays. Apparently the action of the radioactive rays consists in a destruction of the power of reproduction of the malignant cells. The experiments of *Halberstaedter* (see preceding abstract) on trypanosomes are in agreement with this work, since he was able to show that the action of the rays did not destroy the motility of the trypanosomes, but did destroy the power of reproduction. These experiments show that the gamma rays of radioactive substances act directly upon the cancer cells and destroy their power of reproduction, however, without at once killing the cells. The destruction of the sterile cells through age or by the organism itself, takes place later. All of these effects are the result of the *direct* action of the rays upon the cells and there is no reason to believe that the rays applied at one part of an organism would have any effect upon a malignant growth at another place, e. g. metastases.

Wasserman thinks the attempts to sensitize tissues to the action of the rays by the use of salts of heavy metals are without results. He has seen no results thus far in experiments where bismuth and gold compounds were used. Whether or not there may be some general effects of rays upon tumors which have not been subjected to the direct action of the rays is still being investigated.

* * * * *

F. *Gudzent* and L. *Halberstaedter*. Occupational Injuries Due to Radioactive Substances. Deutsche med. Wochenschrift, Vol. 40, pp. 633-5 (1914). From the Radium Institute for Biologic-Therapeutic Research of the Charite in Berlin, Director Dr. *His*. The authors examined twelve persons who had for some time past been working with strong radioactive preparations either in their therapeutic application or in their manufacture. As general conclusions that may be drawn the following points are noted:

The effects of working with radium and strong radioactive substances for long periods are: 1. general changes, as in the blood picture, and in the secretory glands. 2. damage to the skin. Under general changes there was observed a feeling of great lassitude and the necessity of more sleep, headaches, increased irritabil-

ity, attacks of dizziness and fainting spells. The tired feeling and need of more sleep are observed particularly when first beginning to work with radioactive substances or after a long vacation. The degree of general disturbances depends largely upon the length of exposure and the sensibility of the individual. Women seem to be more sensitive than men. In two cases the menses were more prolonged and painful than before. The blood pictures were carefully studied, and show marked changes due to the action of radioactive substances. The number of red blood corpuscles is not much influenced, high counts being observed in several cases (6,600,000; 6,240,000; 6,040,000; 6,000,000) but in the case of persons who are continually working with radioactive substances the number of leucocytes is slightly low, (lowest value 5500). In only two cases was the haemoglobin content low, (70 and 71%). A relative and absolute lymphocytosis was found without exception in all cases. The following values were found:

Case	1	2	3	4	5	6	7	8	11	12
%	41	54	44	44.5	36	48	37	42.5	54	63
Abs. count	2337	3510	2156	3432	1980	3552	2738	3234	3500	5418

Naegeli gives, on 7000 leucocytes, a per cent value of 20 to 25 and an absolute count of 1500 to 2000 lymphocytes. The neutrophiles with but one exception show a relative and absolute diminution, when the normal value is 60 to 70% and 4500 to 5000 per cu. mm. The following figures were obtained on the neutrophiles:

Case	1	2	3	4	5	6	7	8	11	12
%	51	42	54	50.5	60	48	62.5	57.5	42.5	35
Abs. count	2908	2772	2646	3900	3300	3552	4625	4389	2730	3010

The injuries to the skin differ from those reactions encountered in the therapeutic application of radium preparations. In the latter there is usually an acute effect of short rayings. Subjectively there is paresthesia in the finger tips, blunting of the fine sensitiveness, pain when hard objects are grasped and in severe cases, spontaneous and severe burning pain in the fingers.

Objectively the effects are usually confined to the terminal phalanges of the thumb and first two fingers, and the most striking effect is the hyperkeratosis which leaves the skin smooth and parchment-like or leathery. The normal skin picture is obliterated, dirty looking horny layers form under the nails, the skin is spotted severe cases the nails are brittle and at the tip become loosed from the nail bed, being finally deformed. Whether these rather harmless changes may later be the cause of harm cannot now be stated but it is probable that cases of severe burns will result in damages such as is observed in the well known "Roentgen hand." For this reason severe burns are to be carefully avoided, and apparatus for use in the application of radium should be designed with a view to requiring the least possible handling in the course of preparation for use on the patient. Long pincers should be used whenever possible instead of grasping the tube or preparation with the fingers. In factories the general disturbances may be avoided by: 1. very

good ventilation to remove the emanation; 2. protecting the body by using metal plates on the tables to absorb the rays; 3. short working hours and frequent vacations or change of occupation; 4. repeated and careful observations by a physician, especially of the blood picture, which should be observed at least twice a year.

* * * * *

V. *Czerny.* The Action of Mesothorium and Radium. Deutsche Revue, April, 1914. A letter to the Central Committee for Cancer Research. Heidelberg, February 27th, 1914. Since 1903, together with Prof. Richard *Werner,* I have studied the treatment of cancer, using at first 20 to 40 milligrams of radium and during the past two years 160 to 300 milligrams of mesothorium. As we have treated over 4000 cases of carcinoma and sarcoma since 1906, at the Samariter House, we may express an opinion, as indeed we have in many articles and lectures, though it seems not to have been much heeded.

We have ascertained the following:

1. The action of radium and mesothorium is essentially the same.

2. They destroy the tumor cells selectively, up to a certain degree, and can cure superficial cancers. In deep seated cancers frequently unaffected cells are left which give rise to recurrences. Whether the massive doses of mesothorium with heavy screening used by the German gynecologists will prevent the recurrence can only be determined in several years.

3. The therapeutice effect of even the gamma rays does not seem to penetrate deeper than four to five centimeters.

4. The cure is local, does not protect against recurrences and does not prevent metastases.

5. If the intensity of the rays is inadequate to destroy the cancer cells, it has a stimulating effect and may indeed accelerate the growth of the neoplasm.

6. There are many cancers whose energy of growth is so great that the strongest intensities of rays cannot repress the growth or the biological resistance. We have had cases which from the start have grown worse in spite of enormous doses (up to 130,000 milligram hours).

7. In spite of this we recognize that radium and mesothorium are very valuable agents in the treatment of malignant growths, and in inoperable cases they are indispensible. It seems rather premature to put radiumtherapy in place of operative treatment as many gynecologists have done. With the exception of superficial cancers and perhaps some uterine and rectal cancers, it is better to first operate on all cancers where this is possible, and then use radium therapy with a view to preventing recurrences.

8. From the start we have used a combined treatment and we are of the opinion that this gives best results. We have treated superficial growths and those accessible from without, with mesothorium using hard filtered X rays on diffused and deep seated growths (stomach, esophagus, intestinal cancers and multiple metastases).

9. Since the radiotherapy cannot prevent metastases or effect internal metastases we believe that the use of biological or chemotherapeutic methods is also necessary.

10. We have tested many things, for example, arsenic, silicic acid, autolysate, thorium X, etc., and have continued with the use of borcholin (enzytol) since in 25,000 to 30,000 intravenous injections of this substance we have never observed any particular damage and often have found considerable good effects both as regards the general condition, relief of pain as well as the dimunition and removal of the growths. In several cases of inoperable cancer of the stomach which were confirmed by microscopic tests, we have had cures by a combined treatment with enzytol and X rays.

11. It cannot be stated with certainty whether radium therapy, employing the recently recommended doses, will not lead to unforeseen dangerous side effects. In the combined method we have used, we secure results with smaller doses, which are less harmful.

12. Since undoubtedly good results—even if only temporary—have been achieved by the use of radium, the insured people are right in demanding that these new therapeutic agents be used, so that the Imperial workingmen's insurance department must encourage the acquisition of these modern therapeutic agents (radium, mesothorium, modern X ray apparatus, enzytol). For smaller epitheliomata, capsules containing 10 to 20 milligrams of radium, otherwise tubes of 50 milligrams of radium are to be recommended, four of which should be sufficient for average conditions. Whether radium or mesothorium is purchased will depend on considerations of price and what material is available. Since the use of radioactive substances presupposes great experience, if good results are to be attained, it is best that the use of the radium be in the hands of physicians who have worked with it already.

* * * * *

C. *Lewin*. Radiumtherapy in Cancer of the Esophagus and Cardia. Therapie der Gegenwart, (Berlin) Vol. 55, No. 3, March, 1914. The results in twenty-five cases treated by the author are summarized and the technic is described. While the results are far short of those achieved in uterine cancer, there was great improvement in a number of cases. In one case, a woman, the lumen of the esophagus was restored to its normal width by fifteen applications made in a period of four weeks, the applications varying from one to four hours, 50 to 100 mgm. of radium being used.

* * * * *

Gustav *Klein*. The Quantitative Expression of Dosage in Radium and Mesothorium Therapy. Muenchener med. Wochenschrift, Vol. 61, p. 661, (1914). The author suggests that Actinotherapy is preferable to Radiotherapy from a philological standpoint and suggests the use of the former to describe the therapeutic use of X rays and the rays of radium, mesothorium, thorium X, polonium, etc. The expression "100 milligram hours of mesothorium"

is unsatisfactory because one milligram of mesothorium (really mesothorium preparation having activity of one milligram of pure radium bromide, or of 0.536 mgm. radium element) applied one hundred hours, or 100 milligrams mesothorium applied one hour, do not have the same effect, and still would give a dose of "100 milligram hours of mesothorium." *Klein* suggests the dosage be described by giving: 1. the number of applications; 2. the number of milligrams of radioactive substance referred to pure radium bromide; 3. the number of hours in each application, thus for example, 1 x 100 Ra x 10 hours, would signify one application of 100 milligrams of pure radium bromide for 10 hours. This would give a total of 1000 milligram hours. Or 3 x 50 Ms x 10 hours—1500 milligram hours of mesothorium. Where the radioactive salt is not pure—its purity (%) can be noted thus, 10 x 50 Ms (60%) x 12 hours—6000 mgm. hours of mesothorium of 60% purity. This is equivalent to 3600 mgm. hours of mesothorium equal in activity to pure radium bromide. The metal and thickness of the screens must be stated. The use of "Y" in place of radium and "Z" in place of mesothorium is suggested—but seems of no advantage. (Note by abstractor: The description of preparations in terms of their radium element content is the best practice since the therapeutic value is dependent on the radium element content. Other salts than the bromide (sulfate, chloride, carbonate) are now frequently used and these are not equivalent to radium bromide because in the pure state they contain more radium element in equal weights of salt, ($RaBr_2$ $2H_2O$, 53.6% radium; $RaSO_4$, 70.2% radium; $RaCl_2$, 76.1% radium; $RaCO_3$, 79.0% radium). There is never any question if the radium element content of a preparation is stated, since then the purity of the salt and its nature are of less moment. A factor of considerable importance, particularly where superficial lesions are being treated—is the distribution of the radium in an applicator. 10 milligrams of radium element covering 10 sq. cm. in a varnish preparation will have a different effect when applied for two hours, from the same amount of radium spread over 20 sq. cm. and applied for the same length of time. A tube of radium salt applied superficially on a growth will be less effective than the same tube would be if embedded centrally in the growth, where the rays emerging in all directions come into play. With the increased number of scientific papers on the use of radium and mesothorium rays in therapy there is great need for a uniform scientific method of expressing results. The standardization of all radium preparations on the basis of the International Radium Standard is now the accepted practice, and all preparations should be purchased *only on the guarantee by responsible dealers of the content of radioactive element in terms of this standard* or with certificates from the Bureau of Standards. There is nothing to gain in expressing results in terms of radium bromide. This salt is in many ways the most unsuitable for use—it has the lowest radium element content, it is hygroscopic when dehydrated. Traces of moisture in a sealed preparation are decomposed to form hydrogen, oxygen and ozone, and the pressure of these gases may become sufficient to burst a thin glass tube which

is frequently the container. In the presence of moisture the bromide is decomposed with liberation of bromine which attacks metals, when the salt is sealed in a metal tube (platinum for example). Even when the gas pressure is not sufficient to break the glass tube, if for any reason it becomes necessary to open the tube, the expanding gases may cause the salt to be scattered from the tube. Such "radium explosions" while not dangerous as explosions, endanger the valuable radium salt. For this reason the sulfate which is anhydrous and not hydroscopic, is preferable.

Most of the older radium preparations were sold on the basis of an "activity" expressed in terms of the alpha ray activity of uranium metal as unity. This gave large numbers since pure radium bromide was set as 2,000,000 times as active as uranium metal. Half pure radium bromide was said to be of 1,000,000 activity. Unfortunately when such preparations are now compared with radium standards, comparisons being made by means of the gamma rays, it is found in most cases that the radium element content is far below that which is expected. About one-tenth the expected radium content would be an average figure. Thus a preparation of 20 milligrams of radium bromide of 400,000 activity should contain 4 milligrams of pure radium bromide and this would contain 2.14 mgm. of radium element. A sample answering to this description, purchased for four hundred dollars, was recently measured by the writer and found to contain about 0.32 mgm. of radium element. This is only one of many such instances which have come to the writer's notice. C. H. *Viol.*)

* * * * *

Volume 6 of the "Radiologische Mitteilungen" of Kreuznach Springs has just been published in the form of a booklet of 63 pages, containing some interesting articles on radium therapy.

Eicholz, in a brief resume, summarizes the development in radium therapy in the year 1913. Most of the papers referred to have already been abstracted in "Radium."

Vollmer writes on the tested cures by radium drinking water. The German sickness insurance company (Krankenkassen) have sent 38 patients to Kreuznach Springs and the writer reports on the results in these cases, radium drinking water and radium baths having been used. 18 cases of gout and chronic arthritis, 5 cases of neurasthenia, and 15 cases of neuralgia were treated with considerable success.

L. *Wohlfarth,* writing on the effects of radioactive substances in the treatment of tuberculosis, finds injected radium salts and thorium X without much effect. He has observed improvement in some cases but the subject requires more careful study.

W. *Engelmann,* writing on the technic and dosage of radium emanation bath and drinking cures, states that it is his opinion that the bath should contain about 40,000 mache units while in the drinking cure 4,000 to 6,000 mache units should be given per day. However, he thinks the future of radium therapy for internal medicine will probably lie in the application of radium or radium emanation in the form of injections. Otto *Brill.*

For your next cases of

Arthritis and Neuritis

(Subacute or Chronic)

℞ RADIUM

¶ Supplied for administration in the forms of Radium Drinking Water, Radium Bath Water, Radium Ampulles, Radium Compresses and Radio-Active Earth, fully guaranteed as to Radium element content.

¶ Phone or write our representative in your city. He has instructions and dependable data on the subject and will be glad to serve you.

BALTIMORE ..... Th. D. Boulanger, M. D.
2801 West North Avenue
Phone, Walbrook 1859

BOSTON ..... Samuel Delano, M. D.
39 Newbury Street
Phone, Back Bay, 242

CHICAGO..... Geo. D. Browne, M. D.
1125-1126 Masonic Temple
Phone, Central 4174

MINNEAPOLIS..... Samuel S. Houlton, M. D.
West Hotel

NEW YORK ..... C. Everett Field, M. D.
P. O. Box 111, Station F
Phone, Richmond Hill, 487-J

PHILADELPHIA..... Edw. J. Gordon, M. D.
P. O. Box 447

ST. LOUIS..... A. J. Mackay, M. D.
4608 Washington Boulevard
Phone, Forest 1413

¶ Prescriptions filled in our laboratories only.

Radium Chemical Company

PITTSBURGH, PA.

Our Radium Chloride and Radium Sulfate (Standard Chemical Co.) have been accepted by the Council on Pharmacy and Chemistry of the American Medical Association.

STANDARD CHEMICAL COMPANY

PITTSBURGH, PA.

CARNONITE ORE

Miners of Uranium and Vanadium Ores, and Producers of Radium

STANDARD CHEMICAL COMPANY

BLETCHER-ANCHORS CO., PRINTERS, PGH.